



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/599,802

10/10/2006

Biswaroop Mukherjee

7000-365-1A

4842

27820 7590 06/09/2009
WITHROW & TERRANOVA, P.L.L.C.
100 REGENCY FOREST DRIVE
SUITE 160
CARY, NC 27518

EXAMINER

SIVJI, NIZAR N

ART UNIT

PAPER NUMBER

2617

MAIL DATE

DELIVERY MODE

06/09/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/599,802	Applicant(s) MUKHERJEE ET AL.	
	Examiner NIZAR SIVJI	Art Unit 2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 April 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 October 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of the Claim

1. Claim 1 – 34 are currently pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claim 1 – 5, 7, 8, 11, 14 - 22, 24, 25, 28, 31 – 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Garcia-Luna-Aceves et al. (Garcia) Patent. No. 6788702

As Per Claim 1. Garcia teaches a method comprising:

exchanging scheduling information with at least one compatible communication node in a wireless communication network (i.e., scheduling packets are exchanged among neighboring nodes of a computer network. These scheduling packets include descriptions of a transmitting node's 2-hop neighborhood within the computer network, and nodes are able to determine transmission schedules from information received via said scheduling packets Col 6 L 49 - 54);

determining a communication schedule for communications with the at least one compatible communication node based on the scheduling information (i.e., the computer network is a synchronized network in

Art Unit: 2617

which time is divided into a number of frames, each of which are made up of a plurality of slots. In such cases, the exchange of scheduling packets should occur within a first number of the slots of each frame, preferably in a common communication channel. Transmission schedules may be determined, at least in part, because nodes advertise their availability using the scheduling packets Col 6 L 55 -62); and

communicating with the at least one compatible communication node based on the communication schedule, wherein communication nodes in the wireless communication network independently determine communication schedules with other compatible communication nodes (i.e., allow for scheduling transmission times and/or channels at a node of a computer network according to previously reserved and requested transmission schedules received in packets transmitted by neighboring nodes of the computer network. Such packets are transmitted at the beginning of each frame period within the computer network and transmission times and/or channels are schedules for periods indicated as being available according to information included in the packets. In one implementation of this scheme, previously reserved transmission schedules have precedence over the requested transmission schedules and conflicts between requested transmission schedules are resolved according to a priority scheme Col 7 L 7 - 20).

As Per Claim 2. Garcia teaches the method of claim 1 as discussed above

wherein communications with each of the at least one compatible communication node are established over at least one corresponding communication link, which does not contend with other communication links in the wireless communication network during scheduled communications (i.e., avoids collisions by assuming nodes are synchronized with their neighbors, have knowledge of their neighbors' schedules, and are able to receive from multiple transmitting neighbors simultaneously. This final assumption requires fairly sophisticated radio hardware Col 5 L 44 – 49).

As Per Claim 3. Garcia teaches the method of claim 1 as discussed above wherein communications with the at least one compatible communication node are established over a plurality of communication links, which do not contend with each other or with other communication links in the wireless communication network during scheduled communications (i.e., avoids collisions by assuming nodes are synchronized with their neighbors, have knowledge of their neighbors' schedules, and are able to receive from multiple transmitting neighbors simultaneously. This final assumption requires fairly sophisticated radio hardware Col 5 L 44 – 49).

As Per Claim 4. Garcia teaches the method of claim 1 as discussed above wherein the at least one compatible communication node is a plurality of compatible communication nodes and at least one communication schedule is established for controlling communications with each of the plurality of compatible communication nodes (i.e., scheduling packets are exchanged

among neighboring nodes of a computer network. These scheduling packets include descriptions of a transmitting node's 2-hop neighborhood within the computer network, and nodes are able to determine transmission schedules from information received via said scheduling packets. 6 L 49 – 54).

As Per Claim 5. Garcia teaches the method of claim 4 as discussed above wherein scheduling embodied in the at least one communication schedule for each of the plurality of compatible communication nodes within the at least one communication schedule is provided in serial fashion (i.e., communication session between nodes of the network should occupy contiguous time periods over a designated channel. Requested communication sessions are added to the working schedule after verifying that the requested sessions can be accommodated using the feasible schedule. Col 8 L 18 - 23).

As Per Claim 7. . Garcia teaches the method of claim 1 as discussed above wherein the communication schedule provides a schedule for exchanging scheduling information with the at least one compatible communication node (i.e., allow for scheduling transmission times and/or channels at a node of a computer network according to previously reserved and requested transmission schedules received in packets transmitted by neighboring nodes of the computer network. Such packets are transmitted at the beginning of each frame period within the computer network and transmission times and/or channels are schedules for periods indicated as being available according to information included in the packets. In one implementation of this scheme, previously

reserved transmission schedules have precedence over the requested transmission schedules and conflicts between requested transmission schedules are resolved according to a priority scheme Col 7 L 7 - 20).

As Per Claim 8. Garcia teaches the method of claim 1 as discussed above wherein the communication schedule provides a schedule for forwarding traffic to or from the at least one compatible communication node and for exchanging scheduling information with the at least one compatible communication node (i.e., scheduling packets are exchanged among neighboring nodes of a computer network. These scheduling packets include descriptions of a transmitting node's 2-hop neighborhood within the computer network, and nodes are able to determine transmission schedules from information received via said scheduling packets. 6 L 49 – 54).

As Per Claim 11. Garcia teaches the method of claim 1 as discussed above wherein the communication schedule defines transmission opportunities during which communications with the at least one compatible communication node are scheduled to take place (i.e., scheduling packets are exchanged among neighboring nodes of a computer network. These scheduling packets include descriptions of a transmitting node's 2-hop neighborhood within the computer network, and nodes are able to determine transmission schedules from information received via said scheduling packets Col 6 L 49 - 54)

As Per Claim 14. Garcia teaches the method of claim 11 as discussed above wherein certain packets are scheduled to hop through a plurality of compatible

communication nodes during a given transmission opportunity (i.e., channel access used in multihop wireless networks consists of establishing transmission schedules, i.e., allocating stations to different times and data channels (e.g., frequencies, spreading codes, or their combination) in a way that no collisions occur. Transmission scheduling can be static or dynamic; MAC protocols based on dynamic transmission scheduling explore the spatial reuse of the radio channel and thus have much higher channel utilization than such fixed scheduling approaches as TDMA and FDMA Col 4 L 58 – 67).

As Per Claim 15. Garcia teaches the method of claim 11 as discussed above wherein communications with a plurality of compatible communication nodes are scheduled to occur during a given transmission opportunity (i.e., the identification of reserved communication times and/or channels should be made after eliminating any conflicting scheduled transmissions for those communication times and/or channels.Col 7 L 3 – 6).

As Per Claim 16. Garcia teaches the method of claim 1 as discussed above wherein the scheduling information comprises communication parameter information, and the communication schedule is determined, in part, based on the communication parameter information (i.e., transmit/receive schedule at a node of a computer network by first monitoring a common communication channel within the computer network to determine from information included within packets transmitted within the common communication channel previously scheduled transmission times and/or channels and advertised listening times of

Art Unit: 2617

neighboring nodes in the computer network. The information included within the packets should include a list of the neighboring nodes' scheduled outbound communications, a list of the neighboring nodes' scheduled inbound communications and a list of the neighboring nodes' idle communication periods. Col 7 L 29 – 42).

As Per Claim 17. Garcia teaches the method of claim 1 as discussed above wherein the scheduling information comprises at least one of collision information pertaining to past transmission opportunities and susceptibility information pertaining to future available transmission opportunities that may likely be subjected to interference (i.e., A deterministic scheduling algorithm in NETS allows each node to determine collision-free transmission schedules for itself and its 2-hop neighbors based on the information the node receives in NETS packets from its neighbors. This algorithm permits nodes to avoid choosing the same times and data channels for their schedule reservations. Nodes can send information to one another over those times and data channels where they advertise to be listening while not active in scheduled links Col 9 L 47 - 55).

As Per Claim 18. Garcia teaches a communication node comprising:
at least one wireless communication interface (i.e., scheduling packets are exchanged among neighboring nodes of a computer network Col 6 L 49 - 51);
and

Art Unit: 2617

a control system associated with the at least one wireless communication interface and adapted to (i.e., scheduling packets include descriptions of a transmitting node's 2-hop neighborhood within the computer network, and nodes are able to determine transmission schedules from information received via said scheduling packets Col 6 L 50 - 54);

exchange scheduling information with at least one compatible communication node in a wireless communication network (i.e., the exchange of scheduling packets should occur within a first number of the slots of each frame, preferably in a common communication channel Col 6 L 58 - 60);

determine a communication schedule for communications with the at least one compatible communication node based on the scheduling information (i.e., the exchange of scheduling packets should occur within a first number of the slots of each frame, preferably in a common communication channel Col 6 L 60 - 62);

and

communicate with the at least one compatible communication node based on the communication schedule (i.e., the requested communication times and/or channels should correspond to available times and/or channels advertised by one or more nodes of the computer network Col 6 L 67 – Col 7 L 3),

wherein communication nodes in the wireless communication network independently determine communication schedules with other compatible communication nodes (i.e., allow for scheduling transmission times and/or channels at a node of a computer network according to previously reserved and

requested transmission schedules received in packets transmitted by neighboring nodes of the computer network. Such packets are transmitted at the beginning of each frame period within the computer network and transmission times and/or channels are schedules for periods indicated as being available according to information included in the packets. In one implementation of this scheme, previously reserved transmission schedules have precedence over the requested transmission schedules and conflicts between requested transmission schedules are resolved according to a priority scheme Col 7 L 7 - 20).

As Per Claim 19. Garcia teaches a communication node of claim 18 as discussed above wherein communications with each of the at least one compatible communication node are established over at least one corresponding communication link, which does not contend with other communication links in the wireless communication network during scheduled communications (i.e., avoids collisions by assuming nodes are synchronized with their neighbors, have knowledge of their neighbors' schedules, and are able to receive from multiple transmitting neighbors simultaneously. This final assumption requires fairly sophisticated radio hardware Col 5 L 44 – 49).

As Per Claim 20. Garcia teaches a communication node of claim 18 as discussed above wherein communications with the at least one compatible communication node are established over a plurality of communication links, which do not contend with each other or with other communication links in the wireless communication network during scheduled communications (i.e., avoids

collisions by assuming nodes are synchronized with their neighbors, have knowledge of their neighbors' schedules, and are able to receive from multiple transmitting neighbors simultaneously. This final assumption requires fairly sophisticated radio hardware Col 5 L 44 – 49).

As Per Claim 21. Garcia teaches a communication node of claim 18 as discussed above wherein the at least one compatible communication node is a plurality of compatible 'communication nodes, and at least one communication schedule is established for controlling communications with each of the plurality of compatible communication nodes (i.e., allow for scheduling transmission times and/or channels at a node of a computer network according to previously reserved and requested transmission schedules received in packets transmitted by neighboring nodes of the computer network. Such packets are transmitted at the beginning of each frame period within the computer network and transmission times and/or channels are schedules for periods indicated as being available according to information included in the packets. In one implementation of this scheme, previously reserved transmission schedules have precedence over the requested transmission schedules and conflicts between requested transmission schedules are resolved according to a priority scheme Col 7 L 7 - 20).

As Per Claim 22. Garcia teaches a communication node of claim 21 as discussed above wherein scheduling embodied in the at least one communication schedule for each of the plurality of compatible communication

Art Unit: 2617

nodes within the at least one communication schedule is provided in serial fashion (i.e., communication session between nodes of the network should occupy contiguous time periods over a designated channel. Requested communication sessions are added to the working schedule after verifying that the requested sessions can be accommodated using the feasible schedule. Col 8 L 18 - 23).

As Per Claim 24. Garcia teaches a communication node of claim 18 as discussed above wherein the communication schedule provides a schedule for exchanging scheduling information with the at least one compatible communication node (i.e., allow for scheduling transmission times and/or channels at a node of a computer network according to previously reserved and requested transmission schedules received in packets transmitted by neighboring nodes of the computer network. Such packets are transmitted at the beginning of each frame period within the computer network and transmission times and/or channels are schedules for periods indicated as being available according to information included in the packets. In one implementation of this scheme, previously reserved transmission schedules have precedence over the requested transmission schedules and conflicts between requested transmission schedules are resolved according to a priority scheme Col 7 L 7 - 20).

As Per Claim 25. Garcia teaches a communication node of claim 18 as discussed above wherein the communication schedule provides a schedule for forwarding traffic to or from the at least one compatible communication node and

for exchanging scheduling information with the at least one compatible communication node information (i.e., the computer network is a synchronized network in which time is divided into a number of frames, each of which are made up of a plurality of slots. In such cases, the exchange of scheduling packets should occur within a first number of the slots of each frame, preferably in a common communication channel. Transmission schedules may be determined, at least in part, because nodes advertise their availability using the scheduling packets Col 6 L 55 -62);

As Per Claim 28. Garcia teaches a communication node of claim 18 as discussed above wherein the communication schedule defines transmission opportunities during which communications with the at least one compatible communication node are scheduled to take place(i.e., scheduling packets are exchanged among neighboring nodes of a computer network. These scheduling packets include descriptions of a transmitting node's 2-hop neighborhood within the computer network, and nodes are able to determine transmission schedules from information received via said scheduling packets Col 6 L 49 - 54).

As Per Claim 31. Garcia teaches a communication node of claim 28 as discussed above wherein certain packets are scheduled to hop through a plurality of compatible communication nodes during a given transmission opportunity (i.e., channel access used in multihop wireless networks consists of establishing transmission schedules, i.e., allocating stations to different times and data channels (e.g., frequencies, spreading codes, or their combination) in a way

that no collisions occur. Transmission scheduling can be static or dynamic; MAC protocols based on dynamic transmission scheduling explore the spatial reuse of the radio channel and thus have much higher channel utilization than such fixed scheduling approaches as TDMA and FDMA Col 4 L 58 – 67).

As Per Claim 34. Garcia teaches the system of claim 18 as discussed above wherein the scheduling information comprises at least one of collision information pertaining to past transmission opportunities and susceptibility information pertaining to future available transmission opportunities that may likely be subjected to interference (i.e., A deterministic scheduling algorithm in NETS allows each node to determine collision-free transmission schedules for itself and its 2-hop neighbors based on the information the node receives in NETS packets from its neighbors. This algorithm permits nodes to avoid choosing the same times and data channels for their schedule reservations. Nodes can send information to one another over those times and data channels where they advertise to be listening while not active in scheduled links Col 9 L 47 - 55).

As Per Claim 32. Garcia teaches a communication node of claim 28 as discussed above wherein communications with a plurality of compatible communication nodes are scheduled to occur during a given transmission opportunity(i.e., the identification of reserved communication times and/or channels should be made after eliminating any conflicting scheduled transmissions for those communication times and/or channels.Col 7 L 3 – 6).

As Per Claim 33. Garcia teaches the system of claim 18 as discussed above

Art Unit: 2617

wherein the scheduling information comprises communication parameter information, and the communication schedule is determined, in part, based on the communication parameter information (i.e., transmit/receive schedule at a node of a computer network by first monitoring a common communication channel within the computer network to determine from information included within packets transmitted within the common communication channel previously scheduled transmission times and/or channels and advertised listening times of neighboring nodes in the computer network. The information included within the packets should include a list of the neighboring nodes' scheduled outbound communications, a list of the neighboring nodes' scheduled inbound communications and a list of the neighboring nodes' idle communication periods. Col 7 L 29 – 42).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:
1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.

Art Unit: 2617

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
6. Claim 6, 9, 10, 12, 13, 23, 26, 27, 29, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garcia-Luna-Aceves et al. (Garcia) Patent. No. 6788702 and further in view of Yeh Pub. No. 2005/0058151.

As Per Claim 6. Garcia teaches the method of claim 1 as discusses above.

Garcia does not discuss in detail wherein the communication schedule provides a schedule for forwarding traffic to or from the at least one compatible communication node.

However, the preceding limitation is known in the art of communications. Yeh discusses in detail that in the prior scheduling mechanism, a probe can be sent from the source to the destination for a high-priority packet or session to request for data 56 packet slots at intermediate nodes. As soon as the data 56 packet slot is reserved successfully at an intermediate node A (e.g., from t.sub.1 to t.sub.2), the probe can be forwarded to the downstream node B to request for another data 56 packet slot that immediately follows the data 56 packet slot at the upstream node (e.g., from t.sub.2 to t.sub.3). As a result, the effective delay at the downstream node B can be as small as 0 (or a very small value for the turn-around time etc.). Since a packet slot can be scheduled before the node receives the data 56 packet to be transmitted, we refer to this mechanism as "prior scheduling" (Para 211). Therefore, it is obvious to one having ordinary skill in the art at the time the invention was made that the communication schedule provides a schedule for forwarding traffic to or from the at least one compatible

communication node. Thus, the delay is decreased and the throughput will not be degraded.

As Per Claim 9. Garcia teaches the method of claim 1 as discussed above.

Garcia does not discuss in detail wherein the communication nodes in the wireless communication network maintain independent clocks, which are not synchronized with one another.

However, the preceding limitation is known in the art of communications. Yeh discusses in detail that a competitor first decides whether it is preparing to send a prohibiting signal in the following PP-slot. If it does, it selects an appropriate position in the PP-slot either randomly according to an appropriate probability distribution or following certain rules (e.g., according to its priority, urgency, and/or ID). It will then listen to the channel before its time to turn around for transmitting its own prohibiting signal. (As a result, if there is an additional receiver for sensing, the turn-around time can be avoided and considerably increasing the efficiency of MACP/PP.) If it did not hear anything above the appropriate prohibiting threshold, it will transmit a short prohibiting signal at the selected position according to its own clock and viewpoint of the competition frame; however, if it detects any prohibiting signals before the selected position, it loses the competition and will wait for the next competition round or back off for a longer time. A competitor that survives all the prohibiting slots become a candidate, and will become a winner eligible transmitting a control message (or small data packet) if it does not receive any OTS short signals from valid mutual

Art Unit: 2617

hidden terminal detectors (Para 446). Therefore, it is obvious to one having ordinary skill in the art at the time the invention was made that the communication nodes in the wireless communication network maintain independent clocks, which are not synchronized with one another. Thus, will optimize the performance.

As Per Claim 10. Garcia teaches the method of claim 1 as discussed above.

Garcia does not discuss in detail that further comprising providing a plurality of queues for traffic to send to the at least one compatible communication node and corresponding to a plurality of quality of service levels, wherein determining the communication schedule provides scheduling sufficient to ensure communications with the at least one compatible communication node occur according to an appropriate quality of service.

However, the preceding limitation is known in the art of communications. Yeh discusses in detail that there are several major differences between enhanced distributed coordination function and hybrid coordination function. In distributed coordination function, there is only one queue for all packets at a node, while in enhanced distributed coordination function, there are eight separate queues at a node, each for a different traffic category. In such a multiple stream model, the first packet in each queue counts down independently of each other. However, if the counters for more than one queue count down to 0 at the same time, a virtual collision occurs. The queue with the highest priority then has

Art Unit: 2617

the right to send the data 56 packet or the associated RTS 60 message, while the other queue(s) back off and repeats the countdown process (Para 23). Yeh further discusses that IEEE 802.11e is currently being standardized to enhance IEEE 802.11 for QOS provisioning. 802.11e is backward compatible with the 802.11 MAC protocol and supports all the current PHY-layer specifications including IEEE 802.11, 11a, 11b, and 11g, but augments the MAC protocol with the enhanced distributed coordination function (EDCF) and the hybrid coordination function (HCF) (Para 21). Therefore, it is obvious to one having ordinary skill in the art at the time the invention was made that plurality of queues for traffic to send to the at least one compatible communication node and corresponding to a plurality of quality of service levels, wherein determining the communication schedule provides scheduling sufficient to ensure communications with the at least one compatible communication node occur according to an appropriate quality of service. Thus, reducing the delay and increasing the transmission rate of the traffic category.

As Per Claim 12. Garcia teaches the method of claim 11 as discussed above.

Garcia does not discuss in detail wherein the transmission opportunities are variable in length.

However, the preceding limitation is known in the art of communications. Yeh discusses that the group activation message may be initiated by nodes other than the first transmitter A, while node A may schedule for a coordinated time ($t_{sub.1}$, $t_{sub.2}$) (or a subset of it, a superset of it, or simply an overlapping

period of time, depending on the policy) after receiving such a group activation message. The information and instruction in a group activation message may also be combined into an RTS or CTS message, especially when RTS and/or CTS messages are allowed to have flexible length (Para 175). Therefore, it is obvious to one having ordinary skill in the art at the time the invention was made that the transmission opportunities are variable in length. Thus, allowing the packet to be transmitted and or receive concurrently without collisions with reasonably high probability.

As Per Claim 13. Garcia and Yeh teaches the method of claim 12 as discussed above. Yeh further teaches that wherein the lengths of the transmission opportunities are based on communication or scheduling related parameters (i.e., a node may also transmit the group activation message after it successfully scheduled for a transmission reception Para 174).

As Per Claim 23. Garcia teaches the communication node of claim 18 as discussed above.

Garcia does not discuss in detail wherein the communication schedule provides a schedule for forwarding traffic to or from the at least one compatible communication node.

However, the preceding limitation is known in the art of communications. Yeh discusses in detail that in the prior scheduling mechanism, a probe can be sent from the source to the destination for a high-priority packet or session to request for data 56 packet slots at intermediate nodes. As soon as the data 56

Art Unit: 2617

packet slot is reserved successfully at an intermediate node A (e.g., from t.sub.1 to t.sub.2), the probe can be forwarded to the downstream node B to request for another data 56 packet slot that immediately follows the data 56 packet slot at the upstream node (e.g., from t.sub.2 to t.sub.3). As a result, the effective delay at the downstream node B can be as small as 0 (or a very small value for the turn-around time etc.). Since a packet slot can be scheduled before the node receives the data 56 packet to be transmitted, we refer to this mechanism as "prior scheduling" (Para 211). Therefore, it is obvious to one having ordinary skill in the art at the time the invention was made that the communication schedule provides a schedule for forwarding traffic to or from the at least one compatible communication node. Thus, the delay is decreased and the throughput will not be degraded.

As Per Claim 26. Garcia teaches the communication node of claim 18 as discussed above.

Garcia does not discuss in detail wherein the communication nodes in the wireless communication network maintain independent clocks, which are not synchronized with one another.

However, the preceding limitation is known in the art of communications. Yeh discusses in detail that a competitor first decides whether it is preparing to send a prohibiting signal in the following PP-slot. If it does, it selects an appropriate position in the PP-slot either randomly according to an appropriate probability distribution or following certain rules (e.g., according to its priority,

urgency, and/or ID). It will then listen to the channel before its time to turn around for transmitting its own prohibiting signal. (As a result, if there is an additional receiver for sensing, the turn-around time can be avoided and considerably increasing the efficiency of MACP/PP.) If it did not hear anything above the appropriate prohibiting threshold, it will transmit a short prohibiting signal at the selected position according to its own clock and viewpoint of the competition frame; however, if it detects any prohibiting signals before the selected position, it loses the competition and will wait for the next competition round or back off for a longer time. A competitor that survives all the prohibiting slots become a candidate, and will become a winner eligible transmitting a control message (or small data packet) if it does not receive any OTS short signals from valid mutual hidden terminal detectors (Para 446). Therefore, it is obvious to one having ordinary skill in the art at the time the invention was made that the communication nodes in the wireless communication network maintain independent clocks, which are not synchronized with one another. Thus, will optimize the performance.

As Per Claim 27. Garcia teaches the communication node of claim 18 as discussed above.

Garcia does not discuss in detail that further comprising providing a plurality of queues for traffic to send to the at least one compatible communication node and corresponding to a plurality of quality of service levels, wherein determining the communication schedule provides scheduling sufficient

to ensure communications with the at least one compatible communication node occur according to an appropriate quality of service.

However, the preceding limitation is known in the art of communications. Yeh discusses in detail that there are several major differences between enhanced distributed coordination function and hybrid coordination function. In distributed coordination function, there is only one queue for all packets at a node, while in enhanced distributed coordination function, there are eight separate queues at a node, each for a different traffic category. In such a multiple stream model, the first packet in each queue counts down independently of each other. However, if the counters for more than one queue count down to 0 at the same time, a virtual collision occurs. The queue with the highest priority then has the right to send the data 56 packet or the associated RTS 60 message, while the other queue(s) backoffs and repeats the countdown process (Para 23). Yeh further discusses that IEEE 802.11e is currently being standardized to enhance IEEE 802.11 for QOS provisioning. 802.11e is backward compatible with the 802.11 MAC protocol and supports all the current PHY-layer specifications including IEEE 802.11, 11a, 11b, and 11g, but augments the MAC protocol with the enhanced distributed coordination function (EDCF) and the hybrid coordination function (HCF) (Para 21). Therefore, it is obvious to one having ordinary skill in the art at the time the invention was made that plurality of queues for traffic to send to the at least one compatible communication node and corresponding to a plurality of quality of service levels, wherein determining the

communication schedule provides scheduling sufficient to ensure communications with the at least one compatible communication node occur according to an appropriate quality of service. Thus, reducing the delay and increasing the transmission rate of the traffic category.

As Per Claim 29. Garcia teaches the system of claim 28 as discussed above.

Garcia does not discuss in detail wherein the transmission opportunities are variable in length.

However, the preceding limitation is known in the art of communications. Yeh discusses that the group activation message may be initiated by nodes other than the first transmitter A, while node A may schedule for a coordinated time (t.sub.1, t.sub.2) (or a subset of it, a superset of it, or simply an overlapping period of time, depending on the policy) after receiving such a group activation message. The information and instruction in a group activation message may also be combined into an RTS or CTS message, especially when RTS and/or CTS messages are allowed to have flexible length (Para 175). Therefore, it is obvious to one having ordinary skill in the art at the time the invention was made that the transmission opportunities are variable in length. Thus, allowing the packet to be transmitted and or receive concurrently without collisions with reasonably high probability.

As Per Claim 30. Garcia and Yeh teaches the system of claim 29 as discuss above. Yeh further discusses that wherein the lengths of the transmission opportunities are based on communication or scheduling related

parameters (i.e., a node may also transmit the group activation message after it successfully scheduled for a transmission reception Para 174).

Response to Arguments

Applicant's arguments filed 4/10/2009 have been fully considered but they are not persuasive.

In response to applicant's argument that Garcia does not teach "exchanging scheduling information with at least one compatible communication node".

Garcia teaches that scheduling packets are exchanged among neighboring nodes of a computer network refer to as at least one compatible communication node. These scheduling packets include descriptions of a transmitting node's 2-hop neighborhood within the computer network, and nodes are able to determine transmission schedules from information received via said scheduling packets refer to as exchanging schedule information Col 6 L 49 – 54). For at least the above reason, applicant's argument regarding claim 1 is not persuasive and, therefore, the rejection is maintained.

In response to applicant's argument that Garcia does not teach "determining a communication schedule for communications with the at least one compatible communication node based on the scheduling information."

Garcia teaches that the computer network in which time is divided into a number of frames, each of which are made up of a plurality of slots. In such cases, the exchange of scheduling packets should occur within a first number of the slots of each

Art Unit: 2617

frame, preferably in a common communication channel refer to as determining schedule for communications. Transmission schedules may be determined, at least in part, because nodes advertise their availability using the scheduling packets refer to as at least one compatible communication node (Col 6 L 55 – 62). Also note that the definition of Compatible communication node is a node that can work together or exchange data with the neighboring node. For at least the above reason, applicant's argument regarding claim 1 is not persuasive and, therefore, the rejection is maintained.

In response to applicant's argument that Garcia does not teach "wherein communication nodes in the wireless communication network independently determine communication schedule with other compatible communication nodes".

Garcia teaches that the nodes should be configured to maintain working schedules, which list valid transmission times and/or channels previously established or requested by nodes of the network, and feasible schedules, which list valid listening times and/or channels of nodes of the network. Thus, the two or more nodes may be configured to add their own requested communication sessions to their respective working schedules only after verifying availability of time/channel parameters of such requested communication sessions with information from their respective feasible schedules refer to as independently determine communication schedule with other compatible communication node and to exchange working schedules as part of the informing transferred within the common communication channel (Col 8 L 35 – 45). For at least the above reason, applicant's argument regarding claim 1 is not persuasive and, therefore, the rejection is maintained.

In response to applicant's argument that Garcia does not teach limitation of Claim 1. As discussed above, Garcia teaches all the limitation of Claim 1. For at least the above reason, applicant's argument regarding claim 2-5, 7,8, 11 and 14-17 are not persuasive and, therefore, the rejection is maintained.

In response to applicant's argument that Claim 18 is directed to a system claim and recite limitations similar to the limitation of Claim 1. As discussed above, Garcia teaches all the limitation of Claim 1. For at least the above reason, applicant's argument regarding claim 18 are not persuasive and, therefore, the rejection is maintained.

In response to applicant's argument that Garcia does not teach limitation of Claim 8. As discussed above, Garcia teaches all the limitation of Claim 18. For at least the above reason, applicant's argument regarding claim 19-22, 24, 25, 28, 31-34 are not persuasive and, therefore, the rejection is maintained.

In response to applicant's argument that Garcia does not teach limitation of Claim 1 and 18. As discussed above, Garcia teaches all the limitation of Claim 1 and 18. For at least the above reason, applicant's argument regarding claim 6, 9, 10, 12, 13, 23, 26, 27, 29 and 30 are not persuasive and, therefore, the rejection is maintained.

In response to applicant's argument that Garcia and Yeh does not teach "wherein the communication nodes in the wireless communication network maintain independent clocks, which are not synchronized with one another".

Yeh teaches that a competitor first decides whether it is preparing to send a prohibiting signal in the following PP-slot. If it does, it selects an appropriate position in the PP-slot either randomly according to an appropriate probability distribution or

Art Unit: 2617

following certain rules (e.g., according to its priority, urgency, and/or ID). It will then listen to the channel refer to as node before its time to turn around for transmitting its own prohibiting signal. If it did not hear anything above the appropriate prohibiting threshold, it will transmit a short prohibiting signal at the selected position according to its own clock refer to as if it is not synchronized with one another and viewpoint of the competition frame; however, if it detects any prohibiting signals before the selected position, it loses the competition and will wait for the next competition round or back off for a longer time. A competitor that survives all the prohibiting slots become a candidate, and will become a winner eligible transmitting a control message (Para 446).

Yeh further discuss in detail that reception of the last bit of the RTS message (ny the receiver or a nearby node, respectively) where $T_{sub.T}$ is the turnaround time and $T_{sub.PT}$ is the requested packet transmission (PT) time. Note that relative times are specified so that synchronization is not required and the number of bits required for such specifications is reduced as compared to the use of absolute times. Moreover, the required duration for the receiver to be available and the duration for other third-party nodes to be interfered can then be specified with exactly the same relative time duration (Para 168). For at least the above reason, applicant's argument regarding claim 9 and 26 are not persuasive and, therefore, the rejection is maintained.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NIZAR SIVJI whose telephone number is (571)270-7462. The examiner can normally be reached on 7:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, George Eng can be reached on (571) 272-7495. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2617

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/George Eng/
Supervisory Patent Examiner, Art Unit 2617

/NIZAR SIVJI/
Examiner, Art Unit 2617